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Цифровизация российской высшей школы: технологии образовательного процесса (опыт вузов Уральского федерального округа Российской Федерации)

Российская высшая школа находится в постоянной трансформации, что связано с выходом РФ на мировой рынок образовательных услуг. Для достижения целей позиционирования российских вузов в мировых рейтингах создаются различных федеральные проекты, например, в рамках реализации государственной программы «Развитие образования» на 2019–2025 годы разработан проект «Современная цифровая образовательная среда в РФ».

Для анализа готовности российских вузов к цифровой трансформации было проведено исследование, в котором приняли участие студенты вузов Уральского федерального округа Российской Федерации (N=300), которые оценили степень внедрения различных цифровых технологий в образовательный процесс на текущий момент. Именно студентам как основным потребителям образовательных услуг осваивать цифровые компоненты образовательного процесса, использовать технические средства.

Результаты исследования позволили выявить высокую готовность студентов к работе в цифровой образовательной среде, использованию дистанционных форм обучения. Студенты активно используют социальные сети и мессенджеры в образовательных целях (84%), дистанционные технологии образования (48%), мейнфреймы и базы данных (43%). Причем более высокий уровень готовности был продемонстрирован студентами технических и IT-направлений. При этом выявлено противоречие между готовностью студентов и их восприятием технической оснащенности вузов и готовности преподавателей осуществлять образовательный процесс в новой цифровой среде. Очевидно, что использование централизованных цифровых технологий (включенного вузами в образовательный процесс, например, дистанционные технологии применяются еженедельно для 24% опрошенных) значительно уступает стихийному освоению студентами мессенджеров, приложений на смартфонах, иного программного обеспечения, которое облегает освоение курсов и дисциплин (инициировано студентами самостоятельно, обращение к мессенджерам и социальным сетям еженедельно осуществляет 66% от опрошенных).

Таким образом, для реализации государственных программ по созданию цифровой образовательной среды необходимо осуществить усиление технической инфраструктуры вузов и повысить квалификацию преподавателей для эффективного внедрения процессов цифровизации высшей школы.

Ключевые слова: цифровизация образования, российская высшая школа, цифровая образовательная среда, дистанционные образовательные технологии, цифровые технологии

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Digitalization of Russian higher education: educational process technologies (experience of universities of the Ural Federal District of Russian Federation)

The Russian higher school is in constant transformation, which is associated with the entry of the Russian Federation into the world market of educational services. To achieve the goals of positioning Russian universities in world rankings, various federal projects are being created, for example, within the framework of the state program "Development of Education" for 2019–2025, the project "Modern Digital Educational Environment in the Russian Federation" has been developed.

To analyze the readiness of Russian universities for digital transformation, a study was conducted in which students of universities of the Ural Federal District (N = 300) took part, who evaluated the degree of implementation of various digital technologies in the educational process at the moment. It is for students as the main consumers of educational services to master the digital components of the educational process, to use technical means.

The results of the study revealed the high willingness of students to work in a digital educational environment, the use of distance learning. Moreover, a higher level of readiness was demonstrated by students of technical and IT areas. At the same time, a contradiction was revealed between the readiness of students and their perception of the technical equipment of universities and the willingness of teachers to carry out the educational process in the new digital environment. Obviously, the use of centralized digital technologies (included by universities in the educational process) is significantly inferior to the students' spontaneous development of instant messengers, smartphone applications, and other software that facilitates the development of courses and disciplines (initiated by students on their own).

Thus, to implement state programs to create a digital educational environment, it is necessary to strengthen the technical infrastructure of universities and improve the qualifications of teachers for the effective implementation of digitalization processes in higher education.

Keywords: digitalization of education, Russian higher education, digital educational environment, distance education technologies, digital technologies

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Introduction

The digital transformation of society at the beginning of the 21st century radically changed the daily practices of each person, affected different levels of social relations. This applies not only to the explosive growth of digital services in the context of global consumption, but also to the transition of traditional forms of interpersonal interaction within social institutions to digital (in particular, the digitalization of education).

The changing role of technology in society has led to a different perception of education, which is becoming a digital educational service [1, p. 13]. Digitalization of social relations in the Russian Federation has become possible due to an increase in the level of socio-economic well-being of the population (almost every family has a computer, smartphone, and Internet). According to Rosstat in 2019, the population using PCs at the age of 15 years and older is 79.9% in the Russian Federation, in the Sverdlovsk region – 79.8% [2]. VCIOM data for 2020 shows that the share of Internet users among the Russian population is 81%, and 69% use it daily. At the same time, from 68% to 72% of Russians use the Internet for economic purposes, and 63% use it for educational purposes [3].

It is obvious that digitalization of education, including higher education, contributes to the development of distance education technologies, which were initially considered as a condition for removing geographical barriers and making education accessible to the general population. Now distance educational technologies are developing on the online platforms of massive open courses. And only the desire to get a certificate or a state diploma ties them to the existing system of universities and other educational organizations.

The focus of this article is to study the opinion of students of Ural Federal District universities on the prevalence of digital technologies in Russian higher education. In the context of the education research as a global market for educational services, it becomes important to study the opinion and readiness of direct consumers to switch to digital technologies in the educational process.

The main research objective was to analyze the depth of development and intensity of the use of the digital educational environment of universities. The research questions addressed two aspects of the usage intensity of digital technologies. On the one hand, these are centralized digital technologies, that is, initiated by the university – the use of software in laboratory and practical classes, the distant format of mastering certain disciplines. On the other hand, these are spontaneous digital technologies, that is, mastered by students independently, due to their availability on the Internet and which they use for educational purposes. The study is also devoted to identifying the factors that, according to respondents, affect the universities' digitalization in the educational process.

Materials and methods

The study was conducted using a mixed information collection strategy: the quantitative strategy was implemented using the survey method, qualitative strategy - personal interview method (mainly with foreign students, due to the complexity of the topic, an interview was preferred to track the understanding of terms and questions). The questionnaire and guide interview included a similar series of questions about digital technologies used in the educational process. In particular, the information and communication environment of the

university was analyzed (university website, social networks), the frequency of their use, and students' opinions on the impact of certain technologies on the university's digitalization as a whole were also taken into account. The sample consisted of 300 students of the Ural Federal District universities (universities of 3 cities – Ekaterinburg, Chelyabinsk, Tyumen). Survey period: January-March 2020.

The main characteristics of the sample: 44% of women and 56% of men. The study involved 60% of Russian and 40% of Chinese students. This reflects the specifics of many Russian universities – internationalization of education, where the main students from abroad are residents of China. In terms of distribution in the direction of student training: 44% referred themselves to economic specialties, 39% to technical, 17% of respondents to IT specialties.

Literature analysis

Digitalization in the higher education system is considered from several positions: first, as a change in the conditions for the educational process implementation in the student-teacher relationship; secondly, as a change in management technology in the education system (electronic journals, grade books, electronic document management, electronic libraries, research services, databases, etc.) [4; 5]; thirdly, as a change in the organizational structure of education, when universities can be digital – have online courses on online platforms (a digital university is in demand by students 24/7).

This article focuses on changes in the conditions for the educational process implementation, which reveals a complex of interrelated transformations. Then digitalization can be considered as an innovative development of the educational environment and its transformation into a digital educational environment. In this regard, it becomes possible to build an individual trajectory, create conditions for the educational services provision in an inclusive environment, reduce the period of mastering the program, taking into account the level of student training (modular education), and create interdisciplinary groups and projects. In this context, massive open online courses (MOOC), which can be part of the educational process of the university, are actively studied [6; 7]. For example, in UrFU, students can choose majors at the Open Education site. This is reflected in the diplomas and lets you to make an independent choice - an individual trajectory. Also, students of many Russian universities are included in the Skyeng educational environment for learning English.

Digitalization is also represented as a transition from the traditional offline interaction of teachers and students to online interaction, distance technologies development, the creation of online lectures rooms, when students from different parts of the world interact in real time (through apps ZOOM, GOOGLE MEET, etc.).

At the same time, digitalization is considered as a different perception of pedagogical activity, when a teacher becomes a tutor, mentor, coach, coordinator, only directs and helps in development, and is not a translator of knowledge. This can be a way out into virtual reality with game pedagogical technologies as a condition for developing skills and applying them in problem situations [8]. Finally, digitalization is perceived as a different perception of graduates' competencies for the digital economy, which are subject to digital literacy requirements. Also, in the process of digitalization, the student becomes a responsible subject of the educational process. The success of mastering programs largely depends on

his "soft" skills, creative thinking, self-organization and self-discipline skills [6]. In general, in the modern labor market, the ability to handle computer equipment and specialized software is becoming a necessary part of many professions [9; 10].

Realizing the scale of the digitalization process, its speed of spreading in the practice of universities in different countries, a key question arises: the readiness of Russian universities, both in terms of technical means, and in terms of the readiness of the main subjects of the educational process to use technical resources as the main tool for interaction between students and teachers. These issues have been escalated by the COVID-19 pandemic and the accelerated mass transition to a fully distance learning form. As a result of measures taken by administrative structures in different countries to prevent the spreading of coronavirus, universities were compelled to switch to the online interaction format. In these circumstances, every student and teacher faced problems of physical condition in the situation of self-isolation and distance education. The increased strain on the eyes, the development of diseases of osteochondrosis and others are emphasized. These are important aspects of the impact of digitalization on the daily practices of its subjects [11]. As part of the empirical part of the work, we will consider not so large-scale phenomena of the current time, but a more "normal" situation of the implementation of the digital educational environment in the educational process practice of Ural Federal District universities and their technical equipment.

Research results and discussion

Digitalization of Russian higher education is uneven, according to the opinion [12, p. 279- 280], there are significant differences in the use of digital technologies depending on the university's profile (availability of IT-specialties, technical specialties), the material and technical base of the university, the university's status (federal, regional). To form a list of digital technologies, the approaches of N. Sh. Kozlova were used. She notes that digital technologies are constantly being distributed and updated, and it is necessary to start analyzing them with existing hardware – personal computers, smartphones, tablets, as well as programs and services-Office 365, Google. Then it is necessary to move on to the information and communicative environment of the university: social networks, websites, and future move on to the electronic environment – distance technologies and MOOC, and finally, to virtual reality and artificial intelligence [13, p. 87-88].

The empirical data's analysis has shown that the implementation of digital technologies in the educational process is uneven in the Ural Federal District universities. On the one hand, digital technologies have quite deeply penetrated the educational process. Laptops, PCs, projectors, multimedia equipment (92.2%), social networks, messengers (84.4%), GPS, Wi-Fi, 3G, 4G (83.6%) are used largely. These technologies are used by students, both in classrooms and at home, to a greater extent, their use is a student initiative, elements of educational process self-organization. On the other hand, it is obvious that the use of centralized technical means – mainframes and databases in the framework of laboratory and practical classes – is implemented less often – 43%, automation systems and educational process optimization – 45%, distance technologies – 48% of respondents. In this case, distance technologies are understood as the the mastering of individual disciplines on Moodle platforms, in the e-learning system on the Hypermethod platform, in MOOC, and the possibility of learning entirely using distance technologies.

It is worth noting that many universities have created special structures for the distance education development. Frequently, this is a limited set of specialties that universities are ready to offer on the educational services market. For example, Ural State Mining University has a center for distance technologies and e-learning, which offers to fully master only 4 bachelor's degree programs (training is carried out on the Prometheus platform) [14]. And at the Ural Federal University there is an Institute of open education technologies, where you can also master 4 bachelor's programs completely distantly and 9 programs (8-bachelor's, 1-master's), which assume that the last courses / semesters need to be mastered offline [15]. In general, the following technologies exist in UrFU: Moodle, an e-learning system based on the Hypermethod platform, MOOC "Open Education".

In addition to special programs with distance learning technologies, since March 2020, there has been a massive transition of Russian universities to distance learning. Consequently, all teachers and all students found themselves in a situation where there was no choice of learning technology, and everyone had to master new digital competencies (working in new software). *"I will immediately note a huge disadvantage – server overload, it is impossible to complete the started task or test. I think if our university practiced e-learning more often, such problems would not arise in an emergency. I really want homework to appear on time, and not the day before the deadline. If we talk about the advantages, it is independence from the place. That is, I can wake up at a convenient time for me and complete the task lying in bed. It is also convenient for students of neighboring countries who have gladly now gone home"* [16]. It is important to emphasize that not all students were able to continue their studies in this situation, some of them sent letters requesting academic leave due to technical difficulties. The massive transition showed that the problem of digitalization begins with simple technical issues – the availability of means for its implementation. In this case, these are individual means for learning within the distance form: the presence of a PC, laptop, smartphone; the presence of a webcam, a microphone, headphones; availability of printer, scanner. And then these are collective means – technical capabilities of universities: workplaces organized on the university site for recording video materials, conducting broadcasts, etc.

Table 1

Technologies used in the educational process

Digital technologies used	% of respondents		
	Yes, used	No, not used	No answer
Mainframes and databases	43	56	2
Educational software	69	31	0
Automation and optimization of educational processes	45	53	2
GPS, Wi-Fi, 3G, 4G	84	16	0
Laptops, PCs, projectors, multimedia equipment	92	6	2
Social networks, messengers	84	16	0
Smartphones with educational apps	80	20	0
University’s website, electronic library	83	17	0
Robotics, artificial intelligence, virtual reality	23	76	2
Distance technology	48	51	2

Table 2

Frequency of using digital technologies in the educational process (% of respondents)

	Everyday	Few times a week	Once a week	2-3 times a month	Once a month	Once in 2-3 months	Once every six months	Once a year or less	No answer
Mainframes and databases	8	8	3	7	4	5	4	12	53
Educational software	12	13	10	17	6	3	8	5	24
Automation and optimization of educational processes	6	11	7	9	7	2	3	7	48
GPS, Wi-Fi, 3G, 4G	61	6	2	5	2	2	0	2	20
Laptops, PCs, projectors, multimedia equipment	40	23	7	6	4	5	6	2	8
Social networks, messengers	59	7	6	3	2	0	2	2	19
Smartphones with educational apps	52	9	3	5	2	2	2	5	20
University's website, electronic library	22	17	13	12	5	6	5	3	18
Robotics, artificial intelligence, virtual reality	4	10	3	3	4	1	2	5	69
Distance technology	10	14	5	9	5	7	1	2	48

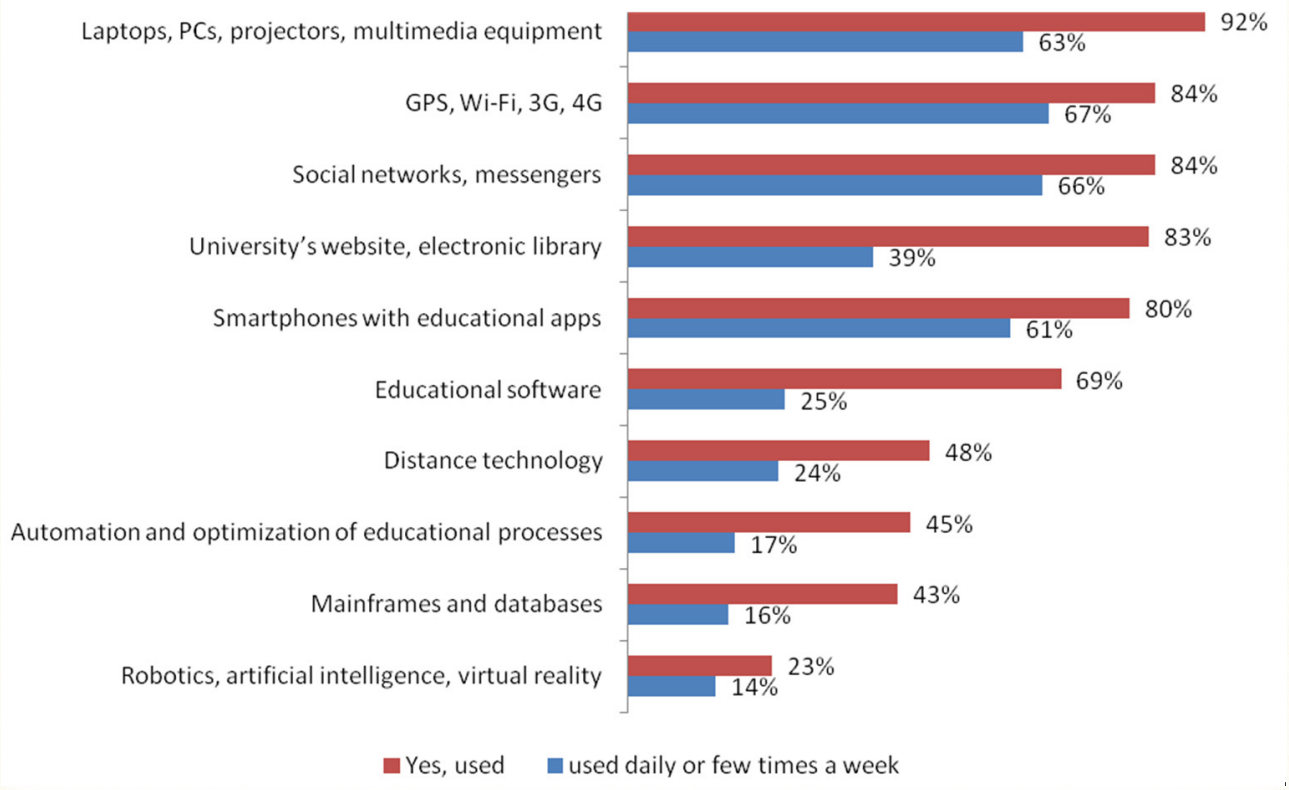

Figure 1 Use of digital technologies in the educational process (frequency of use)

The results of the study show that the use of computer equipment and projection equipment is an obvious leader – 92% of respondents use PCs, laptops or projectors (Table 1, 2, Figure 1). Almost 63% of respondents noted that they use them either daily or few times a week. This fact is easy to explain – almost all coursework, essays or diplomas are written in computer editors, a demonstration of presentations and other educational materials is required.

The second place (84% said that they use them, and 66% – that they use them at least few times a week) is occupied by various wireless communication technologies (GPS, Wi-Fi, 3G, 4G) and social networks with messengers. Students exchange data, especially within the framework of group work, project activities in teams. Social networks make it possible to communicate with both students and teachers. Many student groups create closed communities on social networks where they exchange impressions, documents, video, and audio files.

Students and teachers actively use specialized software, e-books, and libraries in the process. Thus, 83% of respondents supplement their knowledge with electronic resources (websites) and electronic libraries. 39% use them daily or few times a week. Another 80% of the survey participants said that they use smartphones with educational apps installed on them in the educational process (for example, students from China actively use translation apps). 62% use them daily or few times a week. 69% of respondents use specialized educational software and 25% do it at least few times a week. For example, in Urfu in the educational direction "sociology" they master such programs as SPSS and Vortex and use them in their on-the-job training.

Among all technologies, technologies using mainframes and databases were quite rare – 43% said that they use them, and only 13% said that they use them often enough. Basically, such technologies are in demand in technical specialties. About the use of automation of the educational process, 45% of students said that they use it, and only 17% – that they use it daily or few times a week. This is due to the fact that the use of these technologies requires a higher level of competence from the user, the work of these technologies takes place within the framework of specialized training modules and disciplines, unnoticed by users.

Despite the fact that the survey was conducted among full-time students, 48% of students noted the use of distance forms of interaction between students and teachers. 24 % use this technology at least few times a week. These can be technologies that allow conducting joint webinars or conducting classes on electronic educational resources.

More advanced technologies are not as actively penetrating the educational process as we would like. 23% answered that robotics, artificial intelligence, and virtual reality are used in the educational process. Even fewer respondents – only 14%, answered that they use technology daily or few times a week.

Assessing the level of digitalization of higher education, significant factors were analyzed: digital competence of Russian universities' teachers, technical equipment of Russian universities, the use of ICT (Information and Communication Technologies) in the educational process, the use of ICT in communication between teachers and students, the presence of innovative educational projects (Figure 2).

Results discussion

Thanks to the data obtained, it is possible to fix a conflict between students' readiness and unwillingness of teachers to the digitalization of the educational process. The survey participants consider the digital competence of teachers themselves to be the most important factor. 83% of respondents said that this factor has an impact, and 35% – that it has a strong impact (Figure 2).

The next factor that the students who took part in the survey identified and consider it important is the technical equipment of Russian universities. 80% mentioned this factor as having an impact and 30% as having a strong impact.

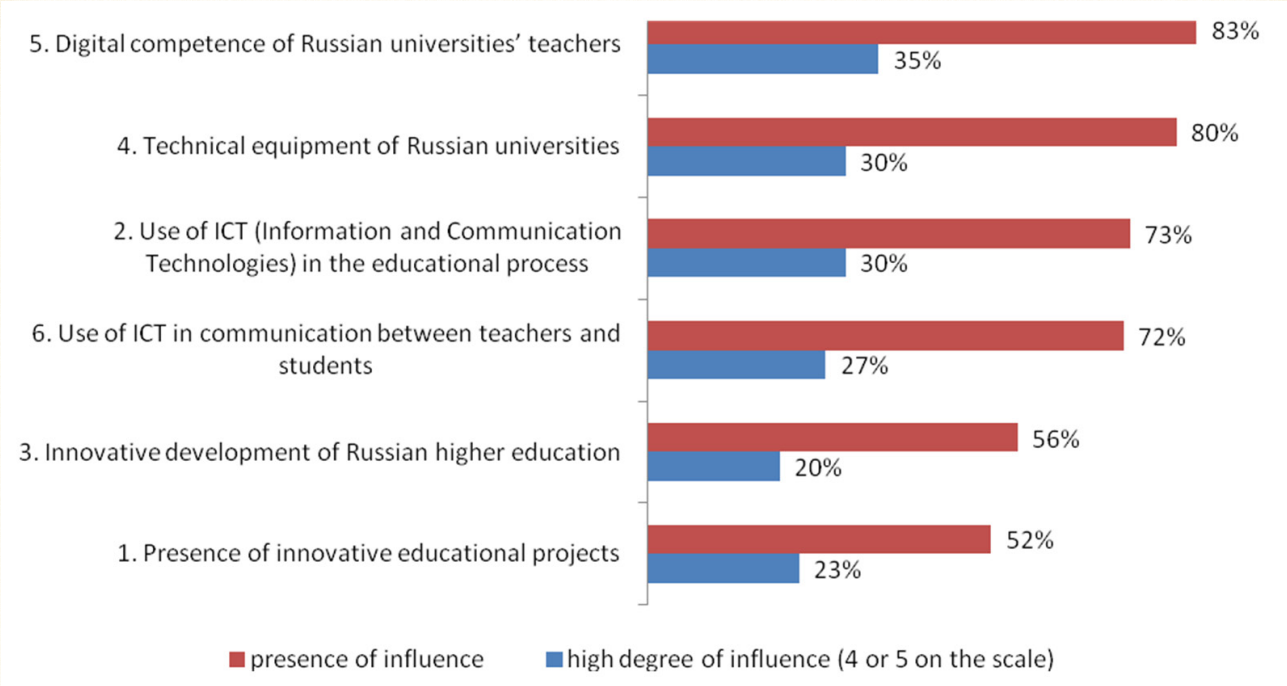

Figure 2 Influence of factors on digitalization of universities (high degree of influence)

In general, the results of the study are consistent with the conclusions of N. Sh. Kozlova, who notes that the distributed use of digital technologies in higher education makes it possible to identify initiative groups or individual teachers who are able to include these technologies in the educational process, rather than generally increase the effectiveness of the traditionally organized educational process [13].

Respondents also praised the use of information and communication technologies (ICT) both in the educational process and in communication between teachers and students. The use of ICT in the educational process as a factor affecting the digitalization of education was noted by 73%, and ICT for communication between students and teachers – by 72%. At the same time, 30% rated the use of ICT in the educational process as a high force of influence on digitalization, and in communication between teachers and students – 27%.

The innovative development of Russian higher education and the presence of innovative educational projects in this peculiar rating of factors take the last place. Even so, more than half of the respondents indicate that these factors affect the development of digitalization. Thus, 56% indicated that the innovative development of higher education has an impact, and 20% – that this impact is high. For innovative educational projects, these figures were 52% and 23%, respectively.

The respondents could also offer their own versions of the factors that affect the digital transformation of education. The importance of an integrated approach ("use it all") was noted. Despite the widespread implementation of messengers and social networks, students still lack efficiency in getting answers ("communication speed"). The key proposal was to equip classrooms with special ports that allow recharging smartphones and laptops ("sockets at each table", "charging connector at each table"). Active use of computer equipment and smartphones leads to the fact that devices are quickly discharged.

Thus, the key factors are related to the lack of readiness of the teaching staff to implement ICT in the educational process on a large scale, as well as the lack of technical equipment of universities.

Conclusion

It is obvious that digitalization is a complex and multi-level process of implementing many technical tools in education that allow organizing the learning process in other realities (virtual world, online communication, electronic educational environment). In the course of the research, the readiness of students for a greater intensity of interaction in the digital educational environment was recorded. In their opinion, the factors of inhibition are the universities themselves, which do not have sufficient technical equipment, and teachers who are not always ready to be available 24/7 in the context of Internet communication. Therefore, digital transformation will only be possible if an enabling environment is created: development of material infrastructure, training of teachers (including through advanced training courses, incentive systems) to work in the digital educational environment.

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